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Remarks/Arguments

Claims 1-10 were canceled and new claims 11-20 have been added.

In reference to the office action, claims 4-9 have been objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from a following claim. This objection is moot since claims 4-9 have been canceled and the new claims are single dependent and no corresponding problem is present.

Claims 1-3 have been rejected under 35 USC 102(b) as being anticipated by the Thompson reference which, according to the Examiner, discloses the claimed low temperature electrochemical method for removing specie X from compound MX comprising the steps of forming an electrolysis system comprising an MX cathode (col. 4, lines 35-37), an anode (col. 4, line 25), and a non-aqueous ionic liquid electrolyte (col. 3, lines 15-16); passing current through the system to remove X from MX and isolating the reaction product, i.e., the metal M (see columns 3 and 4). The reference further discloses, the Examiner alleges, the same metal (see column 3, lines 5-10). Since the Thompson reference discloses each and every limitation, the Examiner concluded that the claims are anticipated.

Contrary to the Examiner's conclusion, it is pointed out that in claim 1 herein, the cathode is a compound MX whereas in the Thompson reference, the cathode is carbon or a metal or a Group VIII metal (see col.4, lines 29-31). In the Thompson reference, the material being removed is dissolved in the electrolyte onto the cathode material. In our claim 11, part (A), X is removed directly from the compound MX into the electrolyte producing product M at the cathode.

In our claim 11, part (B), the voltage at which the cell must

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be operated must be determined from voltage/current plot of the compound MX (Fig. 1). The voltage/current behavior of the species M^+ in the electrolyte is completely different in the Thompson reference from that of MX and occurs at a different electrochemical potential.

In claim 11, part (C), the electrolysis of MX leads to the formation of specie X which passes into the electrolyte leaving the resulting M at the cathode. There is nothing corresponding to this in the Thompson reference.

In conclusion, with respect to the anticipation rejection, it is submitted that the Thompson reference does not anticipate claims 1-3, nor any of the new claims, since it does not disclose any of the parts (A), (B) or (C) of claim 11.

Claim 10 was rejected under 35 USC 103(a) as being unpatentable over the Thompson reference, as applied to claims 1-3, and further in view of the Bales reference. The Examiner contends that the Thompson reference is directed to the production of an alkali metal from an alkali halide but does not disclose the removal of oxygen from titanium dioxide to form titanium metal. The Examiner has concluded that since the Bales reference shows that it is known in the art to remove the oxide from the metal in an electrochemical reduction in non-aqueous solvents as disclosed, the invention as a whole would have been obvious to one of ordinary skill in the art to modify the Thompson reference accordingly because the Bales reference teaches that oxygen can be removed from metal electrochemically in a non-aqueous electrolyte.

In connection with the rejection of claim 10, the Examiner alleges that the Thompson reference is directed to the production of alkali metal from an alkali halide, and does not disclose the removal of oxygen from titanium oxide to form titanium metal. The

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Thompson reference does not teach that an alkali metal can be formed directly from an alkali halide. In the Thompson reference, the alkali halide is dissolved in the electrolyte and then it is plated onto an electrode. The source of the alkali metal in the electrolyte could be any salt which is soluble in the electrolyte. The Thompson reference discloses nothing about isolating the alkali metal directly from a compound MX, as disclosed and claimed herein.

Also in connection with the rejection of claim 10, the Examiner notes that it is known in the art to remove the oxide from the metal oxide in an electrochemical reduction in non-aqueous solvents as claimed (see col. 4, lines 9-14 in the Bales reference). In col. 3, lines 29-31 of the Bales reference, a surface layer of oxide is formed on a metal surface and then it is reduced to form a porous layer on the metal surface. Herein, individual particles of non-conducting titanium dioxide powder, not related to a metal surface, are reduced to the metal at room temperature. The two processes are of completely different nature.

In connection with the rejection of claim 10, The Examiner should note that in both the Thompson and the Bales references, the cathode is a metal and herein the cathode begins as a non-conducting compound, TiO_2 . In the Thompson reference, the metal cathode is used to recover a second metal from the electrolyte and herein, the recovered metal is the cathode. In the Bales reference, an oxidized metal is treated such that only a portion of the oxide is removed to produce a porous oxide covered metal and herein, the oxygen is removed from the compound to produce a metal. Thus, the Bales reference teaches a means to produce a porous oxide layer on a metal not the removal of oxygen from an oxide to produce a metal.

In connection with the combination of references in an obviousness rejection, the case of Interconnect Planning Corp., 227

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USPQ at p. 551, and others, stands for the principle that there must be some reason for the combination other than hindsight gleaned from the claimed invention. Since here, the Thompson and the Bales references have nothing in common, as far as the rejection is concerned, the rejection should be retracted and the claims be allowed.

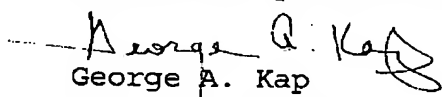
In connection with this invention, it should be pointed out that the invention was presented at a conference and the reaction thereto was incredulous since it was so revolutionary. Presently, about 50,000 tons of titanium metal is produced batch-wise by a process that is just nasty since all its steps are toxic and the electrolyte cannot be readily disposed. The process herein uses a green electrolyte that is environmentally acceptable, and can be readily disposed and re-used. Cost of titanium metal produce by the new process is expected to drop sharply from the present cost.

Electrical conductors include semi-conductors, such as silicon and germanium. What is contemplated herein is un-doped compounds since it is known in the art that conductivity can be imparted or enhanced by doping. Furthermore, the term "non-aqueous ionic liquid electrolyte" is a recognized term of art and can decompose if temperature is raised too high, such as greater than about 400°C.

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It is hereby petitioned to extend time for reply by three months until March 28, 2005. Please charge our account #50-0281 for the extension of time.

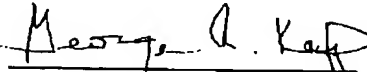
Respectfully submitted,


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Fax Certification

I hereby certify that this document is being faxed to the PTO on the date shown below:

3/28/05
Date


George A. Kap